Journal of the American College of Cardiology Vol. 51, No. 3, 2008

Published by Elsevier Inc.
ISSN 0735-1097/08/$34.00
doi:10.1016/j.jacc.2007.08.059

Short- and Long-Term Prognosis of Syncope, Risk Factors, and Role of Hospital Admission

Results From the STePS (Short-Term Prognosis of Syncope) Study

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Objective We sought to assess short- and long-term prognosis of syncope and associated risk factors.

Background Syncope is a common clinical event, but our knowledge of its short-term outcome is largely incomplete. Further, it is unknown whether hospital admission might positively affect a patient's syncope prognosis.

Methods We screened 2,775 consecutive subjects who presented for syncope at 4 emergency departments between January and July 2004. Short- and long-term severe outcomes (i.e., death and major therapeutic procedures) and related risk factors were compared in all enrolled patients arrayed according to hospital admission or discharge.

Results A total of 676 subjects were included in the study. Forty-one subjects (6.1%) experienced severe outcomes (5 deaths, 0.7%; 36 major therapeutic procedures, 5.4%) in the 10 days after presentation. An abnormal electrocardiogram, concomitant trauma, absence of symptoms of impending syncope, and male gender were associated with short-term unfavorable outcomes. Long-term severe outcomes were 9.3% (40 deaths, 6.0%; 22 major therapeutic procedures, 3.3%), and their occurrence was correlated with an age >65 years, history of neoplasms, cerebrovascular diseases, structural heart diseases, and ventricular arrhythmias. Short-term major therapeutic procedures were more common ($p < 0.05$) in subjects who had been admitted to hospital (13.3%) than in discharged (1.6%), whereas mortality was similar. One-year mortality was greater ($p < 0.05$) in admitted (14.7%) than in discharged (1.8%) patients.

Conclusions Risk factors for short- and long-term adverse outcomes after syncope differed. Hospital admission favorably influenced syncope short term prognosis. Instead, 1-year mortality was unaffected by hospital admission and related to comorbidity. (J Am Coll Cardiol 2008;51:276–83) © 2008 by the American College of Cardiology Foundation

Syncope is estimated to affect 6.2/1,000 person-years (1) and to account for up to 3% of all emergency department (ED) visits and 6% of hospital admissions (2). Syncope may be the final common symptom for a number of clinical conditions spanning from benign conditions to life-threatening diseases. Accordingly, its prognosis varies widely and 1-year mortality may range from 0% in the case of vasovagal events up to 30% in the presence of heart disease (2–6).

Hospital admission is frequent in patients suffering from loss of consciousness because of difficulties in promptly addressing the causes of syncope in the emergency setting, concern about potentially fatal ventricular arrhythmia and sudden death (7), and the possibility, as yet not supported

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by specific studies, that prompt in-hospital evaluation might favorably affect the outcome (8–10). In addition, prognostic scores, meant to provide emergency physicians with reliable guidelines for hospital admission/discharge, have been obtained from mortality and morbidity at 6 or 12 months after the sentinel event (7,11–13). This risk stratification approach implies that risk factors for 1-year adverse outcomes are identical to risk factors affecting the short-term (i.e., up to 10 days) clinical outcome, an assumption, however, that warrants further supporting evidence.

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This study was supported by a donation from Autogrill S.p.A.

Manuscript received April 27, 2007; revised manuscript received August 7, 2007, accepted August 13, 2007.

To date, few investigations have addressed the problem of mortality and the rate of severe outcomes in the period immediately after syncope (14,15). To the best of our knowledge, only one recent prospective single-center study was specifically designed to assess the occurrence of unfavorable outcomes within 7 days from the ED visit (14). However, in that study, serious outcomes also included myocardial infarction, pulmonary embolism, stroke, and other severe diseases that were likely diagnosed primarily in the ED, with syncope being an ancillary symptom. These diseases are characterized by their own short-term mortality that in turn may affect short-term prognosis of syncope.

In the present prospective study, we aimed to assess the short- and long-term prognosis of syncope by evaluating mortality, the rate of major therapeutic procedures, and the predictors of adverse events within 10 days and 1 year from the visit in the ED. In addition, we compared the rate of severe outcomes in admitted and discharged patients both in the short- and long-term periods to determine whether hospital admission favorably affected prognosis of syncope.

Methods

Population. This prospective study included all consecutive subjects older than 18 years of age who presented reporting syncope within the previous 48 h at the ED of 4 general hospitals in Milan area (Sacco, Milan; Fatebenefratelli, Milan; Uboldo, Cernusco s/N; and S. Corona, Garbagnate Milanese), between the January 23 and July 31, 2004.

As shown in Figure 1, 2,775 patients were screened on the basis of the following triaging diagnoses: syncope, loss of consciousness, pre-syncope, fainting, collapse, light-headedness, dizziness, falls, seizures, head injuries, and bone fractures. The following exclusion criteria were used to ultimately determine our target population: 1) the presence of clinical conditions primarily confirmed in the ED that would have required hospital admission independently of the syncope such as myocardial infarction, acute pulmonary embolism, subarachnoidal hemorrhage, stroke, cardiac arrest, sustained bradycardia (<35 beats/min), complete atrioventricular block, sustained ventricular tachycardia; 2) a referred head injury preceding the loss of consciousness; 3) a referred nonspontaneous return to consciousness; 4) nonsyncopal syndromes such as light-headedness, vertigo, coma, shock, and seizure; 5) associated diseases with a prognosis <6 months; 6) recent alcohol or drug abuse; 7) unwillingness to provide consent to participate in the study; and 8) unfeasible follow-up (foreigners, homeless).

Abbreviations and Acronyms

CI = confidence interval
ECG = electrocardiogram/electrocardiographic
ED = emergency department
OR = odds ratio

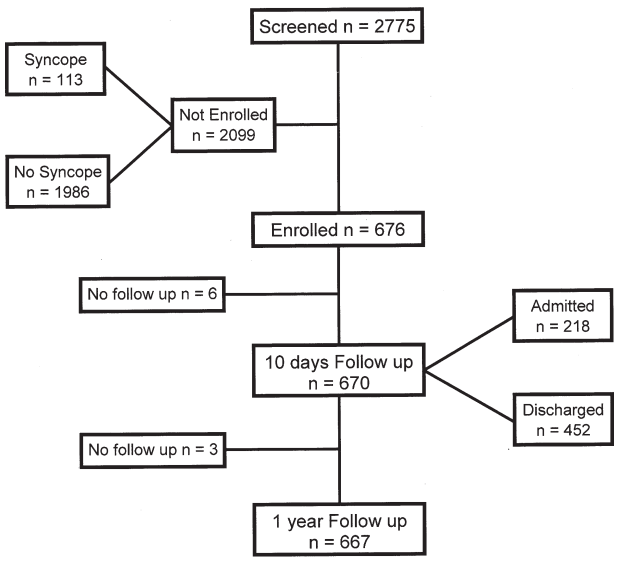

Figure 1 **Flow Diagram of the Screened and Enrolled Population**

Flow diagrams of the enrolled population and short-term and 1-year follow up.

The study was approved by the Ethical Committee on Human Research of the Coordinating Centre (Ospedale "L.Sacco"), and participants provided written consent. Oral consent was obtained in patients discharged from ED that were interviewed by phone.

Definitions. Syncope was defined as a transient loss of consciousness associated with the inability to maintain postural tone, followed by spontaneous recovery (5). Severe outcomes included death, the need for major therapeutic procedures, and early (within 10 days) readmission to hospital. We defined as major therapeutic procedures cardiopulmonary resuscitation, pacemaker or implantable cardioverter-defibrillator insertion, intensive care unit admittance, and acute antiarrhythmic therapy. We considered only those procedures undertaken after the patient was hospitalized from the ED or discharged. As for early readmission to hospital, in keeping with a previous study (14), we assumed that any patient discharged from ED after syncope and then readmitted to hospital for the same or similar symptoms was to be considered at high risk for developing a severe outcome.

Electrocardiogram (ECG) was defined as abnormal in the presence of any of the following: 1) atrial fibrillation or tachycardia; 2) sinus pause ≥2 s; 3) sinus bradycardia with heart rate ranging between 35 and 45 beats/min; 4) conduction disorders (i.e., bundle branch block, second-degree Mobitz I atrioventricular block); 5) ECG signs of previous myocardial infarction or ventricular hypertrophy; and 6) multiple premature ventricular beats. Short-term and 1-year mortality rates were calculated between day 0 and day 10 or between day 11 and 365 from the index event, respectively.

Study end points. The primary aim of the present study was to assess the rate of short- and long-term severe outcomes after syncope and to compare the risk factors associated with the observed short- and long-term adverse

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clinical events. Six participating physicians obtained the ED reports to perform the initial screening; furthermore, they promptly evaluated all the admitted patients in the different divisions. As to the discharged subjects, they were either directly evaluated before discharge or surveyed within 2 days by phone and subsequently within 10 days from the target event, using a 10-item questionnaire. One year follow-up data were collected by the use of phone interviews. If patients were not reachable or unable to talk, their relatives or general practitioners were interviewed. A regional database was consulted to evaluate 1-year mortality of 78 patients who could not be reached by phone.

Our second aim was to evaluate whether hospitalization affected the prognosis of these patients. To achieve this goal, mortality and major therapeutic procedure rates for admitted and discharged patients were evaluated both in the short and long term. However, it must be pointed out that the precise evaluation of this point remains speculative because it is impossible to follow an admitted/discharged randomization procedure for ethical reasons.

Data management and statistical analysis. All data were collected by a physician of the coordinating center and stored in a prospectively designed database. Descriptive statistics for continuous (age) and categorical variables were used to summarize the baseline characteristics of patients enrolled, admitted to hospital and discharged. Differences were evaluated with the Student *t* test, chi-square test, and Fisher exact test (<5 expected events in a cell of the contingency table), whenever appropriate. All analyses were 2-tailed, and p values <0.05 were considered significant.

Potential predictors of hospital admission and of short- and long-term severe outcomes were first individually evaluated and then analyzed by multivariate logistic regression analysis with a stepwise backward selection strategy. The effect of hospital admission on 1-year mortality, adjusted for risk factors, also was evaluated applying the Cox regression. All analyses were performed using SPSS 14.0 for Windows (SPSS Inc., Chicago, Illinois).

Results

As shown in Figure 1 and Table 1, 676 patients satisfied the inclusion criteria and were enrolled in the study; 2,099 subjects were not included. Among these, 1,986 had no definite diagnosis of syncope according to our definition, whereas 113 met the exclusion criteria. We could not reach 6 patients for the scheduled 10-day follow-up. Short-term prognosis analysis of syncope was thus performed on 670 patients. Of note, 452 (67%) patients were directly discharged from ED and the remaining patients were hospitalized. One-year follow-up was obtained for 667 patients. The demographic features and the clinical characteristics of the study population are summarized in Table 1.

Severe short-term outcomes and associated risk factors. Within 10 days from the examination in the ED, 41 subjects (6.1%) exhibited severe outcomes, represented by 5 deaths (0.7 %) and 36 major therapeutic procedures or early readmission (5.4%) (Table 2). Table 3 details the causes of death, along with time of occurrence since the visit in the ED. All patients except for one were older than 70 years. Of interest, 4 of 5 patient deaths happened within 48 h of medical evaluation in the ED. Table 4 summarizes the number and types of severe outcomes other than death.

At univariate analysis, risk factors significantly associated with severe short-term outcomes were: age older than 65 years, male gender, and the coexistence at presentation of structural heart disease, heart failure, chronic obstructive pulmonary disease, trauma, abnormal ECG, and the absence of preceding symptoms (Table 5). At multivariate analysis, an abnormal ECG at presentation (adjusted odds ratio [OR] 6.9; 95% confidence interval [CI] 3.1 to 15.1), a concomitant trauma (OR 2.9; 95% CI 1.4 to 5.9), absence of previous symptoms (OR 2.4; 95% CI 1.2 to 4.8), and male gender (OR 2.2; 95% CI 1.0 to 4.5) were independent risk factors for the development of severe adverse outcomes in the short term (Table 5).

Long-term mortality and severe outcomes. The 1-year overall mortality was 6.0% (40 deaths). There were 22 (3.3%) severe outcomes other than death. At univariate analysis, risk factors significantly associated with the long-term (from the 11th day up to 1 year since ED visit) severe outcomes were age older than 65 years, a history of hypertension, structural heart disease, heart failure, ventricular arrhythmias, cerebrovascular diseases, chronic obstructive pulmonary disease, neoplasms, or abnormal ECG at ED presentation (Table 6). At multivariate analysis, risk factors significantly associated with adverse outcomes included age older than 65 years (OR 3.4; 95% CI 1.6 to 7.4) and the coexistence at presentation of neoplasms (OR 3.2; 95% CI 1.6 to 6.5), cerebrovascular diseases (OR 2.5; 95% CI 1.3 to 4.7), structural heart diseases (OR 2.3; 95% CI 1.3 to 4.2), or ventricular arrhythmias (OR 3.9; 95% CI 1.0 to 15.3) (Table 6). Table 7 specifies the causes of death that occurred from the 11th day up to 1 year since ED visit.

Effects of hospital admission on syncope short- and long-term prognoses. The demographic and clinical features of all patients arranged according to hospital admission or discharge are summarized in Table 1. Please notice that about half of admitted patients were older than 65 years and characterized by a worse medical history than discharged subjects, particularly as far as hypertension, structural heart disease, arrhythmias, cerebrovascular disease, and chronic obstructive pulmonary disease were concerned.

Within 10 days of syncope (Table 2), the rate of severe outcomes was significantly greater ($p < 0.01$) in admitted (14.7%) than in discharged (2.0%) patients. Death occurred in 3 hospitalized (1.4%) and in 2 discharged (0.4%) patients. The 1-year mortality in admitted patients ($n = 32$, 14.7%) was significantly greater ($p < 0.0001$) than that observed in

Table 1 Demographic and Clinical Features of the Population Studied

	Total (n = 670)	Admitted (n = 218)	Discharged (n = 452)	p Value
Age ± SD, yrs	59 ± 22	72 ± 15	53 ± 21	<0.01*
18–44	194 (29.0)	13 (6.0)	181 (40.0)	
45–65	154 (23.0)	39 (17.9)	115 (25.5)	<0.01†
>65	322 (48.0)	166 (76.1)	156 (34.5)	
Gender				
Women	376 (56.1)	114 (52.3)	262 (58.0)	NS†
Men	294 (43.9)	104 (47.7)	190 (42.0)	NS†
Medical history				
Hypertension	265 (39.6)	124 (56.9)	141 (31.2)	<0.01†
Structural heart disease	164 (24.5)	69 (31.7)	95 (21.0)	<0.05†
Heart failure	29 (4.3)	13 (6.0)	16 (3.5)	NS‡
Ventricular arrhythmias	12 (1.8)	7 (3.2)	5 (1.1)	NS‡
Cerebrovascular disease	86 (12.8)	48 (22.0)	38 (8.4)	<0.01†
Neurological disease	65 (9.7)	23 (10.6)	42 (9.3)	NS†
Diabetes mellitus	66 (9.9)	30 (13.8)	36 (8.0)	<0.05†
Chronic obstructive pulmonary disease	53 (7.9)	27 (12.4)	26 (5.8)	<0.05†
Neoplasm	53 (7.9)	32 (14.7)	21 (4.6)	<0.01†
Index syncope history				
Supine/sitting	157 (23.4)	56 (25.7)	101 (22.4)	NS†
Upright posture	498 (74.3)	158 (72.5)	340 (75.2)	NS†
During exercise	15 (2.3)	4 (1.8)	11 (2.4)	NS‡
First episode	290 (43.3)	104 (47.7)	186 (41.2)	NS†
Trauma	161 (24.0)	74 (33.9)	87 (19.2)	<0.01†
Abnormal electrocardiogram at presentation	218 (32.5)	113 (51.8)	105 (23.2)	<0.01†
Absence of preceding symptoms	190 (28.4)	96 (44.0)	94 (20.8)	<0.01†

Values expressed as n (%). p value, admitted versus discharged. *Student *t* test; †chi-square test; ‡Fisher exact test.

discharged subjects (n = 8, 1.8%) (Fig. 2). When the analysis was adjusted for long-term risk factors, hospital admission remained associated with the worst prognosis (Table 8).

Discussion

In the present prospective multicenter study, we addressed 3 major complementary questions. What is the rate of deaths and unfavorable events and what are the predictors of poor outcome within 10 days from the onset of syncope? Are short- and long-term risk factors for adverse outcomes identical? Does hospital admission affect prognosis?

Our data indicate that 1) within 10 days from syncope, 6.1% of patients suffered from serious outcomes, whereas the presence of abnormal ECG at presentation, concomitant trauma, absence of presyncopal symptoms, and male gender were found to be independent risk factors associated with a poor outcome; 2) short- and long-term risk factors were different; and 3) within 10 days from syncope, the rate of major therapeutic procedures was greater in admitted than in discharged patients, indicating a potentially favorable effect of hospital admission on the short-term clinical outcome. However, the 1-year mortality was greater in patients who were hospitalized compared with those who were discharged. Thus, hospital admission after syncope was unlikely to modify the patient's long term clinical history.

Short-term prognosis of syncope and associated risk factors. So far, most of the available data on short-term mortality and adverse outcomes after syncope have been indirectly generated from studies intended for different purposes (13,16,17). Although in-hospital mortality of approximately 1% can be inferred from such studies (13,16,17), an accurate estimate of overall short-term prog-

Table 2 Adverse Short-Term Events in Admitted and Discharged Patients

	Total (n = 670)	Admitted (n = 218)	Discharged (n = 452)	p Value
Death	5 (0.7)	3 (1.4)	2 (0.4)	NS†
Major therapeutic procedures and early readmission	36 (5.4)	29 (13.3)	7 (1.6)*	<0.01‡
Severe outcomes	41 (6.1)	32 (14.7)	9 (2.0)*	<0.01‡

Values expressed as n (%). *p < 0.01 admitted versus discharged. †Fisher exact test; ‡chi-square test.

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Table 3 Reasons and Time of Death, Age, and Gender of Each Patient Who Died Within 10 Days From the Emergency Department (ED) Visit

Patient #	Cause of Death	Elapsed Time From ED Visit	Admitted	Age (yrs)	Gender
1	DIC	24 h	Yes	62	M
2	Acute pulmonary edema	24 h	Yes	90	F
3	Aortic dissection	48 h	Yes	83	F
4	Pulmonary Embolism	24 h	No	72	M
5	Stroke	10 days	No	95	M

Causes of death confirmed by autopsy in Patients #1 and #2, by computed tomography scanning in Patient #3, and based on clinical diagnosis for Patients #4 and #5. A causal relationship between syncope and death within 24 to 48 h is highly likely because of the very short time lag between the 2 clinical events. A more weak relationship characterizes the remaining syncope that is the one associated with stroke and death at 10 days.
DIC = disseminated intravascular coagulation.

nosis of syncope is impossible because no follow-up has been systematically undertaken for subjects discharged from the ED. Only one study was specifically designed to evaluate the rate of severe outcomes within 7 days from syncope and reported such rate to be 11.5%, with a death rate of 0.7% (14). Whereas deaths are comparable, observed adverse events were greater than those found in our study. This might be the result of differences either related to the various types of severe outcomes considered and/or to inclusion/exclusion criteria characterizing the 2 studies. As to this latter point, it has to be noted that we chose not to include cases in which the major diagnoses (such as myocardial infarction, pulmonary embolism, stroke) were done primarily in the ED, as it was in the case of the study by Quinn et al. (14). Indeed, we reasoned that such diseases could have affected syncope short-term outcome by their own poor prognosis. Such a more restrictive approach compared with other studies entails the need of limiting conclusions to our selected population.

In our study, short-term overall unfavorable events were observed in 41 cases and included 5 fatalities. Interestingly, 4 subjects died within 48 h from the sentinel event, highlighting the importance of a prompt risk stratification strategy after syncope possibly best achieved by specifically designed facilities such as the syncope unit (9).

An important result of the present study is the finding that trauma, an abnormal ECG, the absence of symptoms preceding syncope, and male gender were independent risk factors for developing adverse events within 10 days from the index episode. To some extent, these risk factors diverge

Table 4 Major Therapeutic Procedures and Early Readmission Within 10 Days From Syncope

	Patients, n	Clinical Conditions Leading to Major Therapeutic Procedures
PM	21	Complete AV block, Mobitz type 2, second-degree AV block, sustained bradycardia, carotid sinus syndrome
ICD	1	Malignant arrhythmias with severe left ventricular disfunction
CPR	1	Myocardial infarction with respiratory failure
Intensive care unit admission	5	Pulmonary edema, acute respiratory failure, subarachnoid hemorrhage
Intensive care unit admission + ICD	1	Malignant arrhythmias with severe left ventricular disfunction
Antiarrhythmic therapy	3	High ventricular rate atrial flutter or atrial fibrillation with heart failure
Early readmission for syncope recurrence	4	
Total	36	

AV = atrioventricular; CPR = cardiopulmonary resuscitation; ICD = implantable cardioverter-defibrillator; PM = pacemaker implant.

Table 5 Risk Factors for Severe Short-Term Outcomes Within 10 Days (Univariate and Multivariate Analysis)

	Severe Outcomes		
	Yes = 41	No = 629	p Value
Age >65 yrs, n (%)	32 (78)	290 (46)	0.000*
Male gender, n (%)	27 (66)	267 (42)	0.005*
Medical history, n (%)			
Hypertension	18 (44)	247 (39)	0.620*
Structural heart disease	20 (49)	144 (23)	0.001*
Heart failure	5 (12)	24 (4)	0.027†
Ventricular arrhythmias	1 (2)	11 (2)	0.530†
Cerebrovascular diseases	8 (20)	78 (12)	0.220*
Neurological diseases	2 (5)	63 (10)	0.420*
Diabetes mellitus	4 (10)	62 (10)	1.000*
COPD*	7 (17)	46 (7)	0.035*
Neoplasms	5 (12)	48 (8)	0.360*
Trauma, n (%)	17 (42)	144 (23)	0.013*
Abnormal ECG at presentation, n (%)	30 (73)	188 (30)	0.000*
Absence of symptoms preceding syncope, n (%)	19 (46)	171 (27)	0.012*

	Logistic Multivariate Regression (Stepwise Backward)		
	Adjusted Odds Ratio	95% Confidence Interval	p Value
Abnormal electrocardiogram at presentation	6.9	3.1–15.1	0.000*
Trauma	2.9	1.4–5.9	0.004*
Absence of symptoms preceding syncope	2.4	1.2–4.8	0.016*
Male gender	2.2	1.0–4.5	0.037*

*Chi-square test; †Fisher exact test.
COPD = chronic obstructive pulmonary disease; ECG = electrocardiogram.

Table 6 Risk Factors for Severe Outcomes From the 11th Day Up to 1 Year After the ED Visit (Univariate and Multivariate Analysis)

	Severe Outcomes		
	Yes = 64	No = 598	p Value
Age >65 yrs, n (%)	54 (84)	264 (44)	0.000*
Male gender, n (%)	31 (48)	258 (43)	0.430*
Medical history, n (%)			
Hypertension	42 (66)	220 (37)	0.000*
Structural heart disease	34 (53)	125 (21)	0.000*
Heart failure	9 (14)	20 (3)	0.001†
Ventricular arrhythmias	4 (6)	8 (1)	0.022†
Cerebrovascular diseases	22 (34)	63 (11)	0.000*
Neurological diseases	8 (13)	57 (10)	0.500*
Diabetes mellitus	10 (16)	56 (9)	0.120*
COPD*	12 (19)	41 (7)	0.003*
Neoplasms	16 (25)	37 (6)	0.000*
Trauma, n (%)	15 (23)	145 (24)	1.000*
Abnormal ECG at presentation, n (%)	39 (61)	176 (29)	0.000*
Absence of symptoms preceding syncope, n (%)	23 (36)	165 (28)	0.190*

	Logistic Multivariate Regression (Stepwise Backward)		
	Adjusted Odds Ratio	95% Confidence Interval	p Value
Age >65 yrs	3.4	1.6–7.4	0.001*
Neoplasms	3.2	1.6–6.5	0.001*
Cerebrovascular diseases	2.5	1.3–4.7	0.006*
Structural heart disease	2.3	1.3–4.2	0.004*
Ventricular arrhythmias	3.9	1.0–15.3	0.049*

*Chi-square test; †Fisher exact test.
COPD = chronic obstructive pulmonary disease; other abbreviations as in Tables 3 and 5.

from those identified by the San Francisco Syncope Rule (14). Only ECG abnormalities are recognized as risk factors in both studies. Similar to what has been previously observed, dissimilarities in the recruitment criteria may account, at least in part, for such discrepancies. We hypothesize that the prompt identification of short-term risk factors may help emergency physicians in their decision making process and in turn reduce the number of inappropriate hospital admission.

Long-term mortality and severe outcomes. A number of studies have addressed the problem of syncope prognosis,

Table 7 Causes of Death From 11th Day Up to 1 Year After the Emergency Department Visit

Causes of Death	Patients, n
Undetermined	16
Sudden death	3
Pulmonary diseases	7
Cardiovascular diseases	5
Cerebrovascular diseases	3
Neoplasms	3
Others	3
Total	40

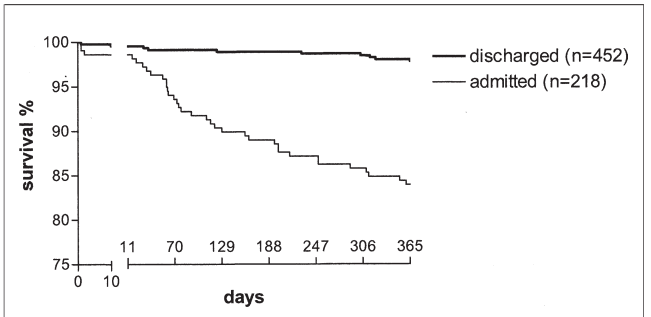

Figure 2 Survival Curves of Patients Admitted to the Hospital and Discharged From the ED

Comparison of 1-year survival curves of patients admitted to hospital and discharged from the emergency department (ED). Notice that patients admitted to hospital after syncope had greater ($p > 0.0001$, log-rank test) rates of mortality than discharged subjects. These differences were also confirmed when adjusting for long-term risk factors.

highlighting its remarkable variability according to the different causes that underlie the loss of consciousness (1,3,4,18–20). In particular, cardiac syncope was characterized by the worst prognosis (1) compared with the virtual absence of mortality at 12 months in the case of vasovagal events (1,3,5).

It has to be noted that guidelines (2,5,21,22) and prognostic scores used in the emergency setting, aimed at stratifying patients according to risk (7,11–13), have been derived from data at 6 or 12 months after the index event (3,11,12,19,23,24). Our data indicate that long- and short-term risk factors are significantly different. Therefore, as long as 1-year follow-up scores are not validated also in the short-term period, the use of long-term risk factors to stratify patient risk in the period immediately following syncope might ultimately prove deceptive.

Does hospital admission affect syncope prognosis? Patients suffering from loss of consciousness are often admitted because of the difficulties in a rapid etiology evaluation in the ED environment, thus increasing the ultimate costs of the diagnostic work-up (25,26), particularly when no standardized decision-making approach is available (27). Accordingly, whether or not hospital admission influences the outcome of syncope (28) becomes an important clinical issue. From a methodological standpoint, we note that the rigorous evaluation of the prognostic effects of hospitalization could have been achieved only by an "admitted/

Table 8 Hospital Admission Adjusted With Long-Term Risk Factors (Logistic Regression)

	Adjusted Odds Ratio	95% Confidence Interval	p Value
Neoplasms	4.4	1.9–10.2	0.001*
Structural heart disease	2.8	1.3–5.9	0.008*
Age	3.3	2.0–5.5	0.000*
Hospital admission	4.1	1.7–9.7	0.001*

*Chi-square test.

discharged" randomization procedure that, however, was not feasible for obvious ethical reasons.

Nonetheless, it is of note that 1) our observed rate of major therapeutic procedures was greater in admitted than in discharged patients; 2) mortality rates were similar in both groups; and 3) all subjects who underwent a major therapeutic procedures could be subsequently discharged. Taken together, these findings indirectly suggest that hospital admission positively affects the short-term clinical outcome in patients suffering from syncope. However, such a likely favorable short-term effect does not necessarily imply a better prognosis in the long-term period.

Indeed, as a consequence of the fact that the only clinical judgment of the emergency physician directed the admitting/discharging procedures, admitted patients were "sicker" than discharged patients, being characterized by a worse medical history. In addition, almost 50% of admitted subjects were older than 65 years of age. Therefore, in the present study, it was not surprising that data at 1-year indicated that admitted patients were characterized by a greater mortality than discharged cases, despite hospitalization and treatment of the presumptive cause of syncope. Indeed, this finding is likely to reflect the importance of comorbidities, as suggested by long-term risk factors such as cardiac and cerebrovascular diseases and neoplasms. Therefore, hospital admission seems to favorably modify the short-term prognosis of syncope possibly because of the promptly undertaken life-saving measures, whereas co-morbidity seemed to play a pivotal role in long-term syncope prognosis.

Study limitations. We are aware of the limitations of the present study. First, as in all observational studies, we could not account for additional and possibly less objective factors that might have ultimately influenced the attending physician in the decision to admit/discharge the patient. Second, no specific protocol was determined a priori and followed whereas the decision on possible patient admission or discharge was based only on the physician's clinical experience. Third, we focused on a composite end point (i.e., severe outcomes), which combined mortality with the rate of those major therapeutic procedures that were assumed, although not proved, to save patient lives.

Conclusions

Syncope is a common clinical event, but data on its short-term prognosis and comparison with long-term prognosis are still scant. In the present study, we addressed these issues and observed that the hours immediately after syncope were characterized by the highest risk for death, whereas co-morbidity seemed to play the major role in determining 1-year mortality. We also found that risk factors for short and long-term adverse outcomes after syncope were different, thus implying that prognostic scores validated on short-term risk factors are required to properly stratify the patient's risk in the ED. Finally, hospital admission seemed to positively affect prognosis within 10 days of syncope, but did not appear to influence the 1-year mortality rate. The latter is likely to be related to the severity of concomitant diseases.

Acknowledgments

The authors are indebted to Dr. L. Bonizzoni and A. Di Scalzi, Regione Lombardia, for their help in consulting the Regione Lombardia database.

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APPENDIX

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